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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/388,567	09/02/1999	HOWARD E. RHODES	303.593US1	4170

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MINNEAPOLIS, MN 55402

EXAMINER

LINDSAY JR, WALTER LEE

ART UNIT	PAPER NUMBER
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2812

MAIL DATE	DELIVERY MODE
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11/21/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

09/388,567

Applicant(s)

RHODES, HOWARD E.

Examiner

Walter L. Lindsay, Jr.

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 05/10/07
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3,6,9-13,15-30,48-54,57,58 and 81-85 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-13,15-30,48-54,57 and 58 is/are allowed.
- 6) ☒ Claim(s) 1,3 and 6 is/are rejected.
- 7) ☒ Claim(s) 9 and 81-85 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

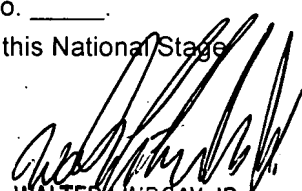
## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
WALTER LINDSAY JR.  
PRIMARY EXAMINER

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

This Office Action is in response to an Amendment filed on 5/10/2007.

Currently, claims 1, 3, 6, 9-13, 15-17, 23-30, 48-54, 57-58 and 81-85 are pending.

#### ***Specification***

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Objections***

2. Claims 1 and 10 are objected to because of the following informalities: "the depth being a substantially same depth that is less than the final thickness and greater than a critical depth across the width of the trench" is unclear. The examiner assumes the applicant to mean, that the width of the trench is formed such that the width is uniformed throughout the trench. "Layers" in claim 3 should be "layer". Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 3, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chopra (U.S. Patent No. 6,413,858 filed 8/27/1999) in view of Uzoh (U.S. Patent No. 6,258,707 filed 1/7/1999).

Chopra shows the structure as substantially claimed in figs. 1-7 and the corresponding text as: an insulating layer (12) having a top surface (col. 5, line 61-col. 6, lines 10); a trench (14) in the insulating layer, the trench having a width and a depth across the width of the trench, the depth being a substantially same depth that is less than the final thickness and greater than a critical depth across the width of the trench (col. 6, lines 11-38), wherein the critical depth includes a vertical thickness of a first barrier layer (20) and a vertical thickness of a seed layer (24) and a vertical thickness of a first metal layer (26) (col. 8, lines 34-41) and a vertical thickness of a second barrier layer (22) (col. 7, lines 9-51); the trench including within the trench and below a level coplanar with the top surface at least and no more than the first barrier layer, the seed layer above the barrier layer, and the first metal layer above the seed layer when the width of the trench is less than a first critical width defined as twice the sum of a sidewall first barrier layer thickness, sidewall seed layer thickness, and a sidewall first metal

layer thickness (col. 7, line 1-col. 8, line 41); and the trench including within the trench and below a level coplanar with the top surface at least the first barrier layer, the seed layer above the first barrier layer, the first metal layer above the seed layer, the second barrier layer above the first metal layer, and a second metal layer above the second barrier layer when the width of the trench is greater than a second critical width defined as twice the sum of the sidewall first barrier layer thickness, the sidewall seed layer thickness, the sidewall first metal layer thickness, and a sidewall second barrier layer thickness (col. 7, line 1-col. 8, line 41). Chopra teaches that the first metal layer is fabricated from copper (26) (col. 8, lines 34-41).

Chopra lacks anticipation only in not explicitly teaching that: 1) an insulating layer having a top surface and a final thickness (claim 1); and 2) wherein each of the first metal layer and the second metal layer include a planar surface polished using chemical mechanical polishing (claim 6).

Uzoh teaches the formation of interconnects. Uzoh discloses the formation of barrier layers and seed layers that are planarized by CMP back (col. 9, lines 42-45). This is done in order to form deep trenches in insulation layers and sequentially filling the opening (col. 2, lines 37-47).

It would be obvious to one of ordinary skill in the art at the time the invention was made to modify, Chopra by forming a top surface with a final thickness and planarizing with CMP, as taught by Uzoh, with the motivation that Uzoh to overcome difficulties in forming deep trenches in insulation layers and sequentially filling the opening.

***Response to Arguments***

6. Applicant's arguments with respect to claims 1, 3 and 6 have been considered but are moot in view of the new ground(s) of rejection.

***Allowable Subject Matter***

7. Claim 9 and 81-85 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 10-13, 15-17, 23-30, 48-54 and 57-58 are allowed.

***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Application/Control Number:  
09/388,567  
Art Unit: 2812

Page 6

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Walter L. Lindsay, Jr.  
Primary Examiner  
Art Unit 2812

WLL

November 14, 2007